12 February 2010 North Central Gulf Coast Heavy Snow Event

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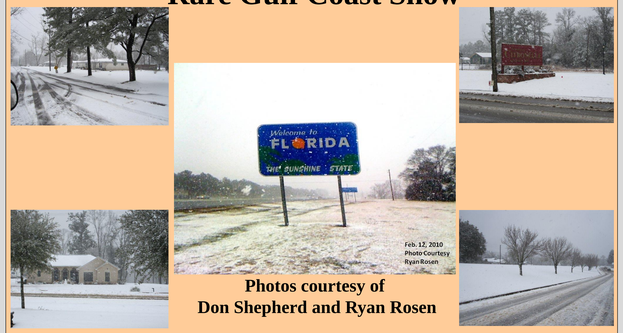
Rare Gulf Coast Snow



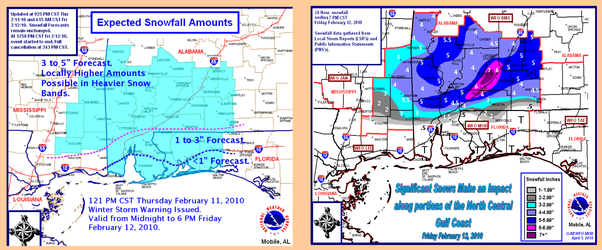
Photos courtesy of Don Shepherd and Ryan Rosen

Introduction

On 12 February 2010 a rare swath of wet, heavy snow fell over a large part of the Deep South. Forecasting this rare event and eliciting the appropriate public response presented unique challenges. Despite these challenges, forecasters alerted the public several days ahead of the event, posting a Winter Storm Watch two days in advance and issuing a Winter Storm Warning 24 hours prior to the storm.

Despite ample lead time, a major challenge in forecasting a rare event of this magnitude is getting the public to first believe the threat and then take action to mitigate the impacts. Along with our standard suite of decision support tools (HWOs, AFDs, Headlines and graphic casts), internet briefings were used to provide details of the event and to inspire confidence in the forecast so needed action could be taken to reduce the impacts of this rare winter storm.

Forecasted and Observed



Snowfall Climatologies

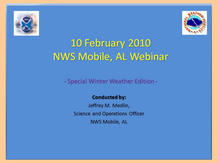
Snowfall climate statistics at the time of the event for sites having 30+ years of observational record.

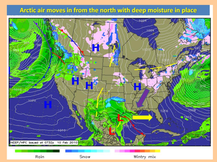
STATE	COUNTY	LOCATION	PROB OF MEASURED SNOWFALL IN FEB	OBSERVED SNOWFALL AMOUNT	RANKING AMONG FEBRUARY SNOWFALLS	RANKING AMONG ALL SNOWFALLS	PROB OF >= OBSERVED SNOWFALL AMT IN FEB	PROB OF >=OBSERVED SNOWFALL AMT ANNUALLY	# OF YEARS OF RECORD
AL	BALDWIN	BAY MINETTE	6.10%	1.5"	2nd	5th	1.50%	6%	66
AL	MOBILE	MOBILE AIRPORT	7.30%	0.5"	4th	12TH (TIED)	5.40%	21.80%	55
AL	WASHINGTON	CHATOM	2.20%	3.0"	1st	4th	<1.00%	6.50%	46
AL	CHOCTAW	MELVIN	5.90%	4.0"	1st	3rd	<1.00%	6.70%	32
AL	CLARKE	JACKSON	3.20%	3.0"	1st (TIED)	3rd (TIED)	3.20%	9.60%	31
AL	CLARKE	THOMASVILLE	6.70%	5.5"	1st (TIED)	1st (TIED)	1.30%	1.30%	75
AL	ESCAMBIA	ATMORE	5.0%	4.0"	1st	1st	<1.00%	<1.00%	31
AL	ESCAMBIA	BREWTON	2.90%	3.0"	2nd	2nd	1.50%	1.50%	68
AL	ESCAMBIA	WALLACE	1.70%	6.0"	2nd	2nd	1.70%	1.70%	58
AL	CONECUH	EVERGREEN	8.00%	5.0"	1st (TIED)	2nd	4.00%	6.00%	50
AL	WILCOX	CAMDEN	6.70%	4.0"	1st	2nd	<1.00%	3.30%	30
AL	WILCOX	PINE APPLE	5.40%	4.5"	2nd	2nd	2.70%	2.70%	37
AL	BUTLER	GREENVILLE	4.90%	4.0"	2nd	2nd	1.20%	1.20%	81
AL	COVINGTON	ANDALUSIA	2.10%	4.0"	1st	2nd	<1.00%	2.10%	47
AL	CRENSHAW	HIGHLAND HOME	7.80%	5.0"	2nd	4th (TIED)	3.10%	6.20%	64
MS	WAYNE	WAYNESBORO	15.90%	3.0"	2nd	11th (TIED)	2.30%	29.50%	44
MS	WAYNE	BUCKATUNNA	1.80%	4.0"	1st	2nd (TIED)	<1.00%	3.60%	55
MS	GREENE	LEAKESVILLE	6.90%	3.5"	2nd	5th	1.40%	5.60%	72
MS	PERRY	BEAUMONT	3.30%	3.0"	1st (TIED)	1st (TIED)	3.20%	3.20%	31
MS	STONE	WIGGINS	4.70%	1.0"	2nd	4th	2.30%	7.00%	43
FL	SANTA ROSA	JAY	2.10%	2.0"	2nd	3rd (TIED)	2.10%	10.60%	47

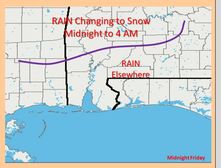
This event was the greatest one day February snowfall at 10 of 21 observation sites and the 2nd greatest at 10 of the sites. At 14 of the sites it was one of the top 3, one day snowfalls of all time.

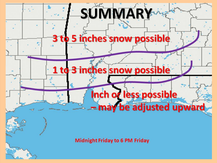
Decision Support

Webinar briefings to emergency managers beginning on Feb. 10









Summary

- Rain changing to snow Thursday night over the interior and then snow line sags southward towards coast during the day on Friday.
- School bus time possibly during peak of event.
- Rain will change to all snow most areas – even along the coast during the day on Friday.
- Accumulations – 3-5 inches over the interior ranging to 1-3 inches over the interior of the coastal counties. An inch or less along the immediate coast (may be adjusted upward).
- Winter Storm Watch will likely be posted by 4 PM for areas north of I-10.
- If current trends continue winter storm warnings and/or advisories may be issued by 4 AM Thursday.

Summary

- Heaviest snow band on Friday!
- Snow sticking – not a problem.
- A wet heavy snow with lots of water in it. This will affect power lines and trees that have still retained foliage.
- Winter Storm Warning means (2"/12h) – Advisory means (.5-1.9"/12h).
- Black ice on bridges, roads and overpasses for a few days after (thaw during day – re-freeze at night).
- Will likely do a Webinar tomorrow at 11 AM.

Response/Feedback

School closures…Government Offices and Local Business closures or delayed openings announced Thursday (Feb. 11) greatly reducing snow impacts.

Director, Washington County EMA:

"…The week of February 8, 2010 had seen forecasts of possibly some light snow accumulation, but there were no firm numbers. However, on Thursday the 11th, the National Weather Service -- Mobile brought us conclusive data, which very accurately determined that a major snowfall would be arriving soon in Washington County. I might add that Washington County has no snow removal equipment with which to clear ice and snow from even the major highways and thoroughfares, much less the miles of rural roads.

On that Thursday, I asked the Washington County school board chairman and other educators to sit in on the afternoon National Weather Service special weather webinar briefing that would fully cover the snow possibilities. After viewing the webinar, and because of the professionalism of the presentation, along with Mobile's high level of confidence in the data at hand, the board chairman made a firm decision right then and there to go ahead and close schools for Friday, the 12th. It was even considered as a possibility to close earlier that same afternoon, but the accuracy of the forecast data did not support the idea, and the school day ended normally without disruption.

The closure for Friday was announced early in the afternoon on Thursday, in plenty of time so that nobody was caught unprepared. This was definitely the right choice; parts of Washington County received as much as 4 inches of snowfall that evening. With the schools closed, the large bus fleet was kept off the roads. There were no dangerous encounters with the numerous slick, bridges and roadways that always come as a result of snow and cold weather combination. Hazardous school bus travel was avoided …"

Director, Clarke County EMA:

"… Significant snowfall in south Alabama is rare and extremely hard to predict. During the week prior to February 12, 2010, the National Weather Service in Mobile began advising the emergency managers in our area of the possibility of a significant snowfall event. As the week progressed, their confidence level continued to increase and they very effectively conveyed their concerns to the emergency management community. During the 5 days prior to the event, we had numerous conference calls and webinars that provided us with the information we needed to prepare our citizens for this event.

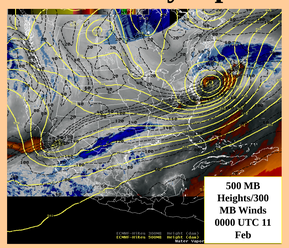
On Sunday, February 7, 2010, I flew to Miami, Florida to attend a training session at the National Hurricane Center. The conference calls and webinars were absolutely critical in my decision making process to protect the citizens of Clarke County. During the Wednesday, February 10th, they gave me the information I needed to make the decision on whether or not to leave the training at the National Hurricane Center and return to Clarke County for preparations. I had several individual phone conversations with the meteorologist at the National Weather Service in Mobile during the week. Based on the information received I recommended to the Clarke County Commission that we proceed with a Local State of Emergency and began public announcements. I arrived home only hours prior to the beginning of the event, with a Local State of Emergency in effect, public notifications (via cell phone to the radio stations in our county) and an EOC activation in progress. Without the long lead time they provided me with I would not have been able to make it back to Clarke County prior to the event.

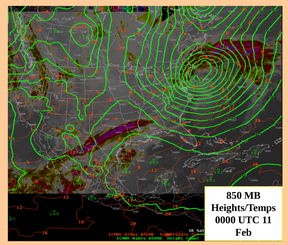
The forecast they issued was truly "exceptional". I could not have asked for a better forecast. The timing of the event (onset/duration) and the accumulation totals were near perfect. …"

Director, Mobile County EMA:

"…As the events leading up to the snowfall of 12 February 2010 began to unfold, WFO MOB continuity issued a variety of products that were instrumental in helping this community prepare for this serious situation. These products were thorough, complete and highly specific. The information concerning the amount of precipitation, timing and location was absolutely essential in formulating critical decisions about storm preparations. Armed with this information, community leaders were able to reduce the risks of exposure to the hazards associated with this rare event by closing schools and deferring openings of other government offices. The clear and confident manner in which the forecasts and amplifying remarks were issued also contributed significantly to this community's ability to prepare for, respond to, and recover from this event with no loss of life and minimal property damage. …"

Synoptic Environment

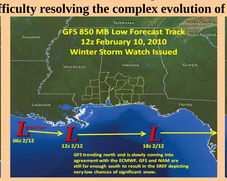


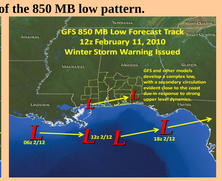


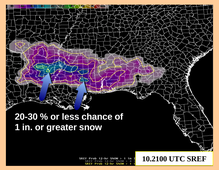
Approximately 36 hours prior to the event, upper air data showed a cold air mass already entrenched over the northern Gulf Coast, with the 0°C 850 MB isotherm just north of the coast. In the upper levels, a very strong southern jet stream was present with winds over 150 KT. A potent 500 MB wave was organizing over Baja California and ejecting east.

Model Projections

Two to three days prior to the event, the GFS was consistently the southern outlier in the track of the surface and 850 MB lows. The ECMWF was consistently further to the north. In turn, the ECMWF depicted stronger frontogenesis and upper level dynamics, allowing for significant cold air advection and dynamics. With the GFS suppressed solution, cold air advection and dynamics were weak. SREF guidance was also affected by the GFS solution on February 10th, showing low probabilities of significant snow. During the 2009 - 2010 winter season, the ECMWF had exhibited more forecast accuracy in projecting weather systems across the Gulf coast region. As the event drew closer, model guidance clustered around the initial ECMWF solution, but continued to have difficulty resolving the complex evolution of the 850 MB low pattern.







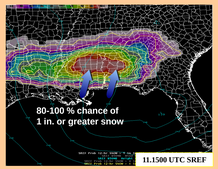
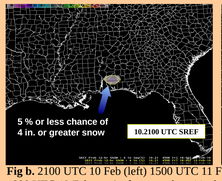


Fig a. 2100 UTC 10 Feb (left) 1500 UTC 11 Feb (right) SREF 12 hour probability (0600-1800 UTC 12 February) of greater than 1 inch snowfall. The probabilities are low on the 10th (20-30%) due to the further south solutions of the GFS and NAM, but increase dramatically (80-100%) on the 11th.



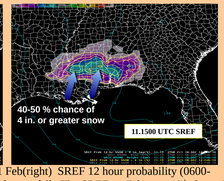
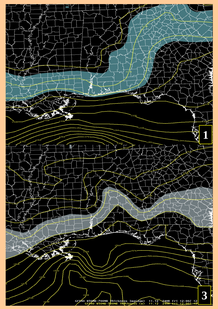
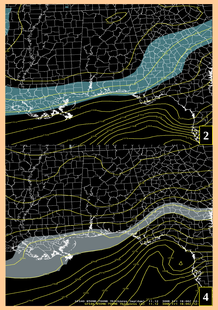


Fig b. 2100 UTC 10 Feb (left) 1500 UTC 11 Feb(right) SREF 12 hour probability (0600-1800 UTC 12 February) of greater than 4 inch snowfall. The SREF on February 10th showed very little chance (5% or less) of greater than 4 inches of snow anywhere across the southeast.





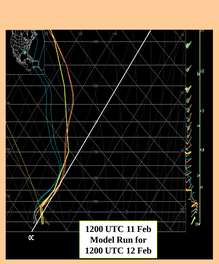
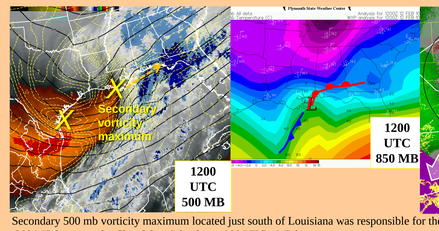


Fig c. 1200 UTC 11 Feb forecast soundings for Mobile, AL 1200 UTC Feb 12 showing deep isothermal near freezing profiles (ECMWF-yellow; GFS-dark orange; NAM-aqua).

Fig d. 1200 UTC 11 Feb GFS 1000-850 MB critical thickness forecast for 1200 UTC Feb 12 (1) and 1800 UTC (2). Shaded region is values between 1305-1290 meters, indicative of potential isothermal layers.

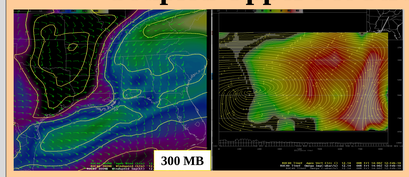
Fig e. 1200 UTC 11 Feb GFS 850-700 MB critical thickness forecast for 1200 UTC 12 Feb (3) and 1800 UTC 12 Feb (4). Shaded region is values between 1555-1540 meters, indicative of potential isothermal layers.

850 MB Evolution



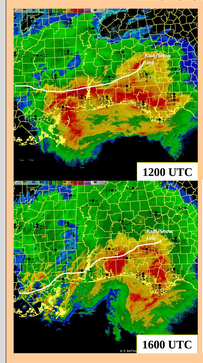
Secondary 500 mb vorticity maximum located just south of Louisiana was responsible for the development of the secondary 850 MB low near the Chandeleur Islands at 1200 UTC 12 February.

Coupled Upper Jet Structure

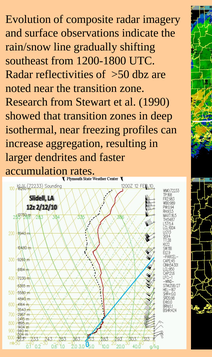


The 300 MB RUC40 analysis at 1400 UTC 12 February depicts a coupled jet structure over the southeast United States. A cross section between the two jets shows the ascending branches of the transverse circulations are collocated with one another, resulting in enhanced upward vertical motion (omega shaded in cross section) as described by Uccellini and Kocin 1987.

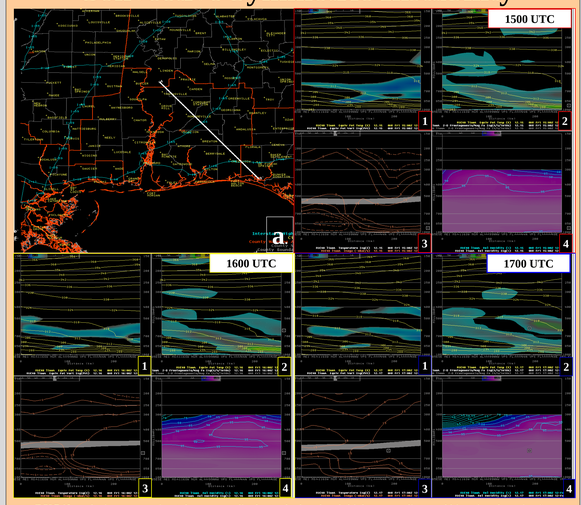
Radar and Observations



Evolution of composite radar imagery and surface observations indicate the rain/snow line gradually shifting southeast from 1200-1800 UTC. Radar reflectivities of >50 dbz are noted near the transition zone. Research from Stewart et al. (1990) showed that transition zones in deep isothermal, near freezing profiles can increase aggregation, resulting in larger dendrites and faster accumulation rates.



Convective Symmetric Instability



RUC40 analysis cross section taken perpendicular to the low level thickness gradient and bisecting the axis of heavier snowfall observed (**figure a**). Each four panel RUC40 analysis depicts: **1.**) equivalent potential temperature and equivalent potential vorticity, **2.**) equivalent potential temperature and Peterson frontogenesis, **3.**) dendritic growth zone (shaded) and omega, **4.**) relative humidity. CSI is present as negative EPV exists above a stable equivalent potential temperature pattern within an area of strong frontogenesis from 1000-700 MB.

For Further Information
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